PRIVATE AND CONFIDENTIAL

RESEARCH DEPARTMENT

VISIT TO FRANKFURT RADIO, TELEVISION AND RECORD PLAYER EXHIBITION, 1959

Report No A-053

(1959/19)

THE BRITISH BROADCASTING CORPORATION
ENGINEERING DIVISION

Research Department

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Section	Title	Page
1	INTRODUCTION	1
2	BROADCASTING ORGANIZATION AND DEVELOPMENT	2
3	RECEIVERS AND ASSOCIATED ITEMS	3
	3.1. Radio Receivers and Sound Reproducers . . .	3
	3.2. Television Receivers	5
	3.3. Receiving Aerials	7
4	MISCELLANEOUS EXHIBITS	7
	4.1. Translator Installations	7
	4.2. Postal Authority's Measuring Van	8
	4.3. Other Commercial Exhibits	8
5	CONCLUSIONS	9

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1. INTRODUCTION

A short visit was paid by the writer to the West German national radio show in Frankfurt. It has now become the custom to hold such exhibitions biennially, previous ones having been held in Frankfurt in 1957 and in Dusseldorf in 1955. The present show, the "Deutsche Rundfunk- Fernseh- und Phono-Ausstellung" was open during 14 to 23 August, 1959, being held (as in 1957) at the Frankfurt "Messegeländer" or showground. This site contains the large Festhalle and many large exhibition halls; eight halls were used for exhibition purposes, a ninth provided two television studios with a balcony open to the public, and the Festhalle was used as a television studio for stage-type productions before a large audience.

The exhibition appeared to have contracted somewhat in scope compared with that in 1957. The main emphasis was on domestic equipment, other exhibits of a professional nature being rather limited and mostly, though not entirely, dealing with components for receivers or sound reproducers. Purely professional radio equipment manufacturers such as Rohde and Schwarz who exhibited in 1957 did not appear to be represented. Some of the larger receiver manufacturers, namely Grundig, Philips, Graetz and Siemens, each occupied one complete hall. The exhibition was not international in character since only West German organizations participated.

The postal administration (Bundespost) had quite a large exhibition area, principally showing mobile measuring equipment and giving information on network planning. The broadcasting authorities of the different regions of West Germany appeared to be co-operating closely both in running their information stand and in organizing television programme productions in the studios on the site, although the studio equipment was provided entirely by the local authority, the Hessische Rundfunk. The press handout was an excellent compendium of information issued in the name of the joint broadcasting organization, A.R.D. ("Arbeitsgemeinshaft der öffentlichrechtlichen Rundfunkanstalten der Bundesrepublik Deutschland").

Before giving details of the exhibition, some general information on broadcasting in West Germany, obtained mainly during discussion with a representative of one of the broadcasting authorities, will be presented. The exhibits can then be judged in their proper setting. Following this, a review of developments in sound receivers, in television receivers and in other domestic equipment will be given; finally some miscellaneous exhibits of interest will be mentioned.

2. BROADCASTING ORGANIZATION AND DEVELOPMENTS

Sound and television broadcasting in Germany is the responsibility of a number of separate public corporations each covering a particular area. Their activities and interests are co-ordinated through the A.R.D. mentioned above. Under the A.R.D. there is a joint research department, Institut für Rundfunktechnik (IRT), which has laboratories at Munich and at Hamburg, the former dealing with television research and the latter with propagation and other radio problems. Each regional authority is responsible for the engineering as well as the programme production in its area.

At present there is a single-programme television service in the sense that it is planned to give one programme in any one area. The programme, however, may be a local one, but it is principally one produced for the complete network, each region contributing a certain allotted percentage of the programmes of the national network ("Deutsche Fernsehen"). As in the United Kingdom, the postal authority is responsible for the main links between transmitters.

The numbers of sound receiver and television receiver licences in West Germany were 15.6 million and 2.7 million respectively on 1st July 1959.

Many low-power translator stations are now in use in West Germany to improve the television coverage. Thus Südwestfunk has over 50 translators in operation, while Westdeutscher Rundfunk has 30; the latter authority also has nearly 20 "umlenkantennen" or redirecting aerials. Low power translators or redirectors are used mainly in the hilly areas to serve villages lying in the valley; some employ vertical polarization and in many cases translator powers of only 50 mW, with e.r.p.s of up to 1 W maximum, are used.

At present there are several u.h.f. television stations which, having presumably served experimental purposes, are in regular service reinforcing the coverage of the main television programme; however, an important development expected to take place towards the end of 1960 is the opening of a new u.h.f. television network to carry a second television programme. Although the "second programme" is widely referred to in the television receiver sales literature, the German Government has not yet decided on the authority to be responsible for erecting the stations. Thus the Bundespost has put forward their plan involving some 40 stations covering 70% of the population and costing about 40 million marks. The broadcasting authorities on the other hand have proposed another plan for about 25 transmitters which they consider can cover 75% of the population at a cost of 25 million marks; part of the lower cost of the latter scheme can be attributed to the use of some existing site facilities. The question of programme arrangements for the new service was not pursued as this is not an engineering matter, but it is possible that if commercial programme companies are to be formed the postal authority might be favoured; on the other hand, if the existing authorities were to be allowed to run the second service and to take more advertisements (some advertising material is already allowed) it would appear appropriate for them to erect the stations.

Concerning television frequency channels in the v.h.f. and u.h.f. bands, two points of interest may be mentioned. First, Channel 11 (216-223 Mc/s) is widely used in Germany as in other parts of Europe, although it comes outside the original official Band III range of 174-216 Mc/s. Secondly, the Bundespost has given official channel numbers to Bands IV and V; there are 40 channels, 8 Mc/s wide, starting with Channel 14 at 470-478 Mc/s and finishing with Channel 53 at 782-790 Mc/s. It will be noted that the numbering allows the possibility (there is as yet no reason to put it any higher than this) of two extra channels being added to Band III and of making use of frequencies in the gap between the bands 470-585 Mc/s and 610-960 Mc/s, officially termed Bands IV and V. At the same time the use of frequencies above 790 Mc/s is not envisaged.

Since receivers with u.h.f. tuners are now being widely sold in Germany it would be difficult to adopt other than a 5.5 Mc/s vision-to-sound carrier spacing in the new band.

The German authorities are taking an interest in precision offset as a means of reducing co-channel interference in television. Experiments are in progress between the Channel 8 stations at Feldberg (Schwarzwald) and Feldberg (Taunus, near Frankfurt), but they are at this stage only exploratory, and methods of application when the frame frequency varies have not yet been tried.

In sound broadcasting only two main programmes are available to the listener in most areas, although the North and West regions have a third programme in the evenings. It is important to realize that in general only one programme is put out on medium frequency; thus, compared with the position in the U.K., there is a greater incentive to include v.h.f./f.m. in all types of receiver, since it means a wider choice of programme. A new musical programme service has recently been started for the small hours of the morning. This is broadcast by a group of the medium-frequency transmitters covering most of the country, the broadcast authorities being responsible in turn for originating the programme on a fixed rota. The period of transmission is 0010 to 0550 hrs. local time.

3. RECEIVERS AND ASSOCIATED ITEMS

3.1. Radio Receivers and Sound Reproducers

The main impression received at the exhibition was of the wide variety of sound radio receivers now available in Germany. Large radiograms, now mostly fitted with twin audio-frequency units for stereophonic disk recordings, and many portable receivers were available as indeed in Britain; yet the large wooden-cabinet table model is evidently still popular in Germany although it has largely disappeared in the U.S.A. and is becoming less popular in the U.K. As further evidence, many table model receivers were fitted with twin amplifier and speaker systems so that the gramophone terminals could be used with a record player and stereophonic pick-up.

In the field of portable receivers the outstanding development is the all-transistor a.m./f.m. receiver. Some six firms now have current models of this type, the first one being on the market about March 1959 (the Südfunk model). Prices are mostly between 279 and 300 marks, with one at 348 marks, and are little different from those of valve portables with both a.m. and f.m. ranges. The total number of transistors is generally nine and the circuit arrangement on the f.m. range uses two v.h.f. transistors (Valvo type OC171 or Telefunken type OC615), one as an r.f. stage and the other as an oscillating mixer. These are followed by two or three i.f. stages, usually at the standard frequency of 10.7 Mc/s, and a ratio detector. A push-pull audio frequency output stage is generally provided, and in some models gives more than one watt of output power. Two or three of the receivers include long-, medium- and short-wave a.m. ranges. The case is generally designed so that the portable may be used as a car radio, an input socket for a car radio aerial being provided. However, since the battery drain is so small, it is considered easier to continue to run it from its own batteries (7.5 V or 9 V total) rather than provide an extra plug etc. to run from the car battery. Incidentally it is claimed that this gives greater freedom from interference owing to the complete isolation of the power supply.

At the other extreme, one or two pocket size m.f.-band midget sets were available, for example the Grundig model measuring 4.5 x 3 x 1.2 in. (11.5 x 7.5 x 3 cm) and selling for 116 marks. One transistor set was combined with an alarm clock.

On the record-player and tape-recorder side there was evidence of increasing public interest. Developments in stereophonic gramophone equipment are remarkable for their rapidity and almost simultaneous occurrence in many European countries and in America. This contrasts with the first introduction of ordinary long-playing records some years ago, when it seemed, in the early stages at least, merely a rather slow and reluctant acceptance of developments in the U.S.A. It is thus difficult to give any appreciation of the position that would be of lasting value. However, while many new radiograms fitted with two amplifiers and loudspeakers for stereophonic record reproduction were being exhibited, it is interesting to note that there was little evidence of complete portable stereophonic record players of the type being widely sold in Britain; instead it seems that, for those not wishing to buy a full-size radiogram, a turntable unit with a stereo pick-up is used with a "stereo" table-model receiver of the kind mentioned above.

Turning now to tape-recorders, many quite small models are being offered to the public including the Grundig portable one (also sold in Britain) which is no bigger than a portable radio of a few years ago. There is a trend towards lower speeds and the use of four tracks in domestic tape-recorders; 3$\frac{3}{4}$ and 1$\frac{7}{8}$ in./s (9.5 and 4.75 cm/s) are commonly used speeds.

Finally, it might be mentioned that a record player for the car was being exhibited; on the stand it was shown playing happily while being jolted to simulate a pretty rough ride.

3.2. Television Receivers

The new television receivers on show appeared to have very good performance. Only 17 and 21 in. tubes are widely used and 14 in. tube models were not seen. The average picture size in use is therefore probably slightly greater than in Britain. Prices however are somewhat higher on the average and cover a bigger range than those of British receivers; the new models generally use the 110° deflection-angle tubes. The cheapest 17 in. table model is priced at 495 marks (or 582 marks with u.h.f. tuner). There are very few portable receivers of the type sold in Britain, but a special small set using an 8 in. American 110° deflection tube is offered by one manufacturer.

One thing worth noting is that the number of receivers with most or all of the d.c. component of the video waveform applied to the c.r.t. is increasing in Germany and has reached a very high proportion, whereas it is decreasing in Britain. The explanation is probably on the following lines. One reason for not having the full d.c. component is that, with poor e.h.t. regulation, focus and picture size can be upset; another reason is that a.g.c. circuits - more in the case of positive modulation (Britain) than negative modulation (Germany) - must be fairly complicated if the full d.c. is to be preserved. Now that e.h.t. regulation has been improved there is little reason not to have the d.c. component in Germany, whereas in Britain where there is keen price competition the "back-porch" gated a.g.c. necessary to preserve d.c. with positive modulation is now rarely used.

Television receivers are tuned mainly by the turret system as in Britain. However, a very large proportion of the new models are fitted with automatic fine tuning. Since the "inter-carrier sound" arrangement (a 5.5 Mc/s sound i.f. amplifier fed from the post-vision-detector circuits) is universal, a.f.c. cannot, as might at first be thought, be arranged from the f.m. sound discriminator; it is necessary to have an extra discriminator, usually working at the vision carrier intermediate frequency, to derive an a.f.c. control potential. The local oscillator frequency is adjusted by using a gold-bonded point-contact diode (e.g. Telefunken type OA180) as a variable reactor. In some cases, where a manufacturer provides models both with and without automatic tuning, the OA180 diode is retained in the turret tuner of the simpler model, manual fine tuning being achieved by means of a potentiometer adjusting the back-voltage applied to the diode. Automatic adjustment of the picture contrast according to the ambient lighting was fitted on some models, a highly sensitive photo-resistor of sintered cadmium sulphide being used in a suitable circuit; this idea may be taken up more widely in the future.

A widely used selling point at the exhibition, besides that of automatic tuning just mentioned, was that television receivers were fitted with tuners for reception of the new "second programme" on u.h.f. It appears that the adaptation of the turret tuner for u.h.f. channels, as was at first done in some American receivers, is not favoured in Germany. Instead, a separate small unit continuously tunable over the 470-790 Mc/s range is switched in as an alternative "front end" to the turret tuner used on v.h.f. A grounded-grid u.h.f. triode, type OC86, has for some time been produced in Germany by some three valve manufacturers, and accordingly is already similar in price to other valves. Two of these triodes are used in the tuner, the first as a u.h.f. amplifier and the second as an oscillating mixer. The strip-line cavities (generally two for the signal frequency and one for the oscillator) are tuned by ganged variable capacitors, and a noise factor better than 15 dB over the band is claimed. The input terminals are usually 240-ohm balanced, (as is universal in Bands I, II and III in Germany) but tuners are often designed basically for 60 ohms unbalanced and employ a balun. There is a feeling amongst some manufacturers that u.h.f. aerials should in future always have 60-ohm coaxial downleads, and it is likely that experience will gradually lead receiver manufacturers to adopt 60-ohm unbalanced input sockets for u.h.f.

The stage of development in regard to u.h.f. tuners in receivers is that some manufacturers already have them fitted in certain standard models, some can fit them as an optional extra (about 100 to 150 marks additional cost) while others will have them in standard models in a few months' time. One or two manufacturers were showing u.h.f. converters for operation in conjunction with existing receivers. Incidentally, the importance attached to u.h.f. developments is shown by the use, specially for the exhibition, of two u.h.f. television transmitters, one at Feldberg (Taunis) on Channel 27 and the other close to the exhibition halls on Channel 20.

One manufacturer is employing some unconventional circuitry in the sound channel of its television receivers. A semiconductor diode limiter plus a so-called "Jantzen" detector is used in place of the usual ratio detector. This appears to be a kind of Foster-Seeley discriminator but the full development suggested by Mayo for the f.m. receivers developed in B.B.C. Research Department has not been used. The subsequent audio amplifier is a completely transformerless valve circuit feeding an 800-ohm loudspeaker.

directors.

Fuba supplies aerials for a large number of translator installations, but the translator units themselves are made by Rohde and Schwarz and by Wisi as well as by Fuba. As mentioned earlier, an output power of only 50 mW is commonly used for these installations.

4.2. Postal Authority's Measuring Van

The Bundespost were showing a large estate-car type of vehicle fitted out to d.f. signals in Bands III and IV; it was being demonstrated in operation.

A panoramic receiver is used in conjunction with a rotating aerial on the roof of the vehicle. A certain frequency range within the band is explored by having the usual type of panoramic receiver display on an oscilloscope, the sweep rate being 75 c/s. It is then possible to "gate out" any particular frequency and a second oscilloscope is arranged to show, in polar diagram form, the variation of strength as the aerial rotates; the aerial polar diagram is drawn with an orientation on the display which immediately indicates the bearing of the transmission.

The wide-band aerials for Bands III and IV used on the van were supplied by the aerial firm of Wisi. It was also possible by means of an additional telescopic dipole to operate the equipment in Bands I and II; a highly directional aerial in these bands would, of course, have been rather cumbersome.

4.3. Other Commercial Exhibits

Telefunken had their new Model M10 professional tape recorder on show. It is a studio machine available with speeds of 15 and 7½ in./s (38 and 19 cm/s) in the standard model but an alternative model gives 30 and 15 in./s (76 and 38 cm/s). Telefunken will shortly have available a new semi-professional transportable tape recorder, the Model M24, which weighs 26 kg and will be sold for 1790 marks.

Grundig were showing a very neat television camera which could be remotely controlled and is weather-proofed for outside operation. Their method of demonstrating it was rather interesting. A camera had been mounted on a high building in the centre of Frankfurt. On the stand there were some television receivers and in front of them on a table was a small joystick. By operating this the camera could be panned and tilted; the zoom lens could also be remotely operated. It was thus possible to get on the television screens excellent views of Frankfurt's buildings or street scenes; needless to say there was no shortage of operators from the public. Grundig evidently have a considerable interest in industrial television applications, and had a very small camera for examining the inside of tubes only about 2½ in. (6.5 cm) in diameter. It appeared that their small basic camera unit Type FA10 was being used both in this and in the roof-mounted camera.

5. CONCLUSIONS

The main impression left by the Exhibition was of the large variety of radio and television receivers being offered. There is more emphasis on refinements than in Britain and it must presumably follow that more customers in Germany are prepared to pay the extra cost of automatic tuning, automatic adjustment of brightness and contrast in television receivers with room lighting and so on. The Germans appear to be ahead of both the U.S.A. and the U.K. in the development of transistor v.h.f. receivers for the public. However, it must be remembered that this development is stimulated by the much greater reliance on v.h.f. for a multi-programme service in Germany.

Again, the general desire for a second television programme coupled with the wide use of all the available television channels in Bands I and III for the first programme, has stimulated Band IV developments and it appears that German industry is already well prepared in the provision of suitable receivers. The position on the administrative side is less clear; although the broadcasting authorities are co-operating well together and with the Bundespost in present broadcasting activities, there is some uncertainty on the part they will play in future television developments.

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